Claims

What is claimed is:

1. A system for controlling a thin film deposition process, comprising:

one or more thin film deposition components operative to deposit a thin film on one or more portions of a wafer;

a thin film deposition component driving system for driving the one or more deposition components;

a system for directing light on to the deposited thin film and collecting light reflected from the deposited thin film;

a monitoring system adapted to detect structural irregularities associated with the deposited thin film by comparing reflected light data associated with the deposited thin film with a database comprising known thin film reflected light signatures; and

a processor operatively coupled to the monitoring system and the thin film deposition component driving system, wherein the processor receives data from the monitoring system and communicates deposition parameter adjustments to the one or more deposition components according to the received data using feedback control.

2. The system of claim 1, the monitoring system comprising a scatterometry system for processing the light reflected from the thin film.

3. The system of claim 2, wherein structural irregularities associated with the thin film includes at least one of pinholes, depressions, air bubbles, bumps, voids, agglomerates, large grains, second phase compositional variations and impurities, or a combination thereof.

4. The system of claim 2, wherein the processor determines the presence of an unacceptable thin film deposition condition for at least a portion of the wafer according to the data received from the monitoring system.

5. The system of claim 2, wherein the deposition parameter adjustments comprise at least one of thickness, uniformity, rate of deposition, pressure, flow rates of reacting species, flow rate of carrier gas and temperature or a combination thereof.

6. The system of claim 2, wherein the processor is operatively coupled to a non-linear training system which facilitates the processor in determining deposition parameter adjustments to the one or more deposition components according to the received data.

7. The system of claim 2, wherein the processor partitions the mask into a plurality of grid blocks and makes a determination of deposition conditions at the one or more grid blocks.

8. A system for controlling a thin film deposition process, comprising:

one or more thin film deposition components operative to deposit a thin film on one or more portions of a wafer;

a thin film deposition component driving system for driving the one or more deposition components;

a system for directing at least one of acoustic waves and ultrasonic waves on to the deposited thin film;

a monitoring system adapted to detect structural irregularities associated with the deposited thin film by comparing at least one of reflected acoustic wave and ultrasonic wave data associated with the deposited thin film with a database comprising known thin film reflected acoustic signatures; and

a processor operatively coupled to the monitoring system and the thin film deposition component driving system, wherein the processor receives data from the monitoring system and communicates deposition parameter adjustments to the one or more deposition components according to the received data using feedback control.

9. The system of claim 8, the monitoring system further including at least one of an acoustic system and an ultrasonic system for processing acoustic and/or ultrasonic waves reflected from the thin film.

10. The system of claim 9, wherein structural irregularities associated with the thin film include at least one of pinholes, depressions, air bubbles, bumps, voids, large grains, agglomerates, second phase compositional variations and impurities, or a combination thereof.

11. The system of claim 9, wherein the processor determines the presence of an unacceptable thin film deposition condition for at least a portion of the wafer according to the data received from the monitoring system.

12. The system of claim 11, wherein the processor controls the one or more deposition components to regulate depositing thin film.

13. The system of claim 9, wherein the deposition parameter adjustments include at least one of thickness, uniformity, rate of deposition, pressure, rate of flow of reacting species and temperature or a combination thereof.

14. The system of claim 9, the processor mapping the mask into a plurality of grid blocks, and making a determination of deposition conditions at the one or more grid blocks.

15. The system of claim 9, wherein the processor is operatively coupled to a non-linear training system which facilitates the processor in determining deposition parameter adjustments to the one or more deposition components according to the received data.

16. The system of claim 9, the monitoring system further including an

acoustic system for processing at least one of acoustic waves and ultrasonic waves passing through the thin film.

17. The system of claim 16, the processor being operatively coupled to the acoustic system, the processor analyzing data relating to thin film deposition received from the acoustic system, and the processor basing control of the one or more thin film deposition components at least partially on the analyzed data.

18. A system for controlling a thin film deposition process, comprising:

one or more thin film deposition components operative to deposit a thin film on one or more portions of a wafer;

a thin film deposition component driving system for driving the one or more deposition components;

a system for directing at least one of acoustic waves and ultrasonic waves on to the deposited thin film;

a monitoring system adapted to detect structural irregularities in the deposited thin film by comparing at least one of reflected acoustic wave and ultrasonic wave data associated with the deposited thin film with a database comprising known thin film reflected sound signatures;

a system for directing light on to the wafer;

a monitoring system adapted to detect structural irregularities in the deposited thin film by comparing reflected light data associated with the deposited thin film with a database comprising known thin film reflected light signatures; and

a processor operatively coupled to the monitoring system and the thin film deposition component driving system, wherein the processor receives data from the monitoring system and communicates deposition parameter adjustments to the one or more deposition components according to the received data using feedback control.

19. The system of claim 18, the monitoring system further including a scatterometry system for processing the light reflected from the thin film.

20. The system of claim 19, the monitoring system further including an acoustic system for processing at least one of acoustic waves and ultrasonic waves reflected from the thin film.

21. The system of claim 20, the monitoring system further including an acoustic system for processing at least one of acoustic waves and ultrasonic waves passing through the thin film.

22. The system of claim 21, the processor being operatively coupled to the scatterometry system, the processor analyzing data relating to thin film deposition received from the scatterometry system, and the processor basing control of the one or more thin film deposition components at least partially on the analyzed data.

23. The system of claim 22, the processor mapping the mask into a plurality of grid blocks, and making a determination of deposition conditions at the one or more grid blocks.

24. The system of claim 22, wherein the processor determines the presence of an unacceptable thin film deposition condition for at least a portion of the wafer according to the data received from the monitoring system.

25. The system of claim 24, wherein the processor controls the one or more deposition components to regulate depositing thin film.

26. The system of claim 18, wherein the deposition parameter adjustments include at least one of thickness, uniformity, rate of deposition, pressure, rate of flow of reacting species and temperature or a combination thereof.

27. The system of claim 18, wherein the processor is operatively coupled

to a non-linear training system which facilitates the processor in determining deposition parameter adjustments to the one or more deposition components according to the received data.

28. A method for monitoring and controlling the deposition of a thin film, comprising:

depositing a thin film on a wafer;

directing a light onto the thin film;

collecting a light reflected from the thin film;

employing scatterometry means to analyze the reflected light to determine one or more properties of the thin film; and

controlling a deposition component to deposit thin film on the wafer.

29. The method of claim 28, wherein the properties include at least one of thickness, uniformity, presence of defects, and presence of impurities or a combination thereof.

30. The method of claim 29, further comprising using a processor to control the at least one deposition component based at least in part on data received from the scatterometry system.

31. A method for monitoring and controlling the deposition of a thin film, comprising:

depositing a thin film on a wafer;

directing a sound onto the thin film;

collecting a sound reflected from the thin film;

employing acoustic means to analyze the reflected sound to determine one or more properties of the thin film; and

controlling a deposition component to deposit thin film on the wafer.

32. The method of claim 31, wherein the one or more properties include at least one of thickness, uniformity, presence of defects, and presence of impurities, or a combination thereof.

33. The method of claim 32, further comprising:

collecting a sound passing through the thin film; and

analyzing the passed through sound to determine the properties of the thin film.

34. The method of claim 33, further comprising using an acoustic system to process the passed through sound.

35. A method for regulating a process for depositing a thin film, comprising:

using one or more deposition components to deposit a thin film;

determining the characteristics of the deposited thin film; and

using a processor to coordinate control of the one or more deposition components to deposit subsequent thin film.

36. A system for regulating a process for depositing a thin film, comprising:

means for using one or more deposition components to deposit a thin film;

means for determining the acceptability of the thin film deposition; and

means for using a processor to coordinate control of the one or more deposition components to deposit the thin film.